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Rubber Journal and International Plastics

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June 20 1959

Notes of the Week

Compression

THE journal this week—but a shadow of its normal self—somewhat sadly reflects the current dispute in the printing industry and it is regretted that publication may be suspended next week. Circumstances quite beyond our control make it inevitable that a number of regular features should be omitted, special articles held over and the first International Plastics Exhibition review reduced almost to vanishing point. A number of features has had to be omitted and these are listed elsewhere. In this connexion, it should be pointed out that our issue of June 13, containing a preview of many of the exhibits at Olympia and photographs of personnel on the stands, is available on the RJIP stand No. 410 on the first floor of the National Hall. Books published by Maclaren and Sons Ltd. for RJIP, and others available from our book department, are also displayed. Visitors are welcome.

Expansion

THE International Plastics Exhibition, which opened at Olympia, London, on Wednesday (closing 6 p.m., June 27), has got off to a tremendous start. Even apart from the tools, machines, equipment and materials used by manufacturers, many of which were previewed in the June 13 issue of RJIP, there is an immense amount to see. More than 200 plastics products from 12 countries, on show in the display of international designs, are proof that modern designers are thinking at last in terms of plastics as materials in their own right and taking advantage of their unique properties, particularly as regards form and colour, to produce entirely new and notable designs over a wide range of articles. From the point of view of the man in the street, the exhibition must come as an eye-opener to the extent of the present uses, and the even more extensive future uses, of plastics. Much has been said at conferences and Plastics Institute meetings about the need for publicity for the industry. In that respect alone, the exhibition will undoubtedly prove to have been extraordinarily useful.

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NEWS *Briefs*

US POLYPROPYLENE — MONSANTO POLYTHENE PRODUCTION—GLASGOW EXPLOSION—RUSTYFA CONTRACT FROM ROUMANIA — RUSSIAN ORDER

●**United States** — Two credits amounting to 1,200m. lire to build a carbon black plant and expand the manufacture of telecommunications equipment in Italy were announced in Washington on May 27 by the Export-Import Bank. The Bank said one credit of 600m. lire was being made to Cabot Italiana SPZ and the other, also for 600m. lire, to Fabbrica Apparachiature per Communicazioni Elettriche Standard SPA.

●**Brazil**—Brazil's Minister of Agriculture called a meeting of representatives of the large tyre-manufacturing firms recently to discuss the problem of the expanding consumption of raw rubber, and the difficulties in obtaining foreign exchange to cover imports. Raw rubber consumption is estimated at 60,000 tons for 1959, compared to 42,000 tons in 1958. Domestic production is estimated at 23,000 tons.

●**Russia**—A substantial order for polyester resins has been placed by Russia with Artrite Resins Ltd. The resins are for use in reinforced plastics.

●**United States**—Rubber sandwiches between slabs of concrete are being used for an experimental stretch of the Baltimore-Harrisburg way now under construction at Hereford, Maryland. The installation marks the first highway use of a new rubber expansion joint developed by B. F. Goodrich.

●**Italy** — The Societa per Azioni Laminati Plastici, of Milan, has announced that negotiations are proceeding between shareholders and Formica International Ltd., of London, for sale to Formica of a major holding and direct control of the company. This move is to increase output and distribution on the Italian market of Formica products for which the Societa Laminati Plastici already holds the licence. Formica International is owned 60% by the British firm De La Rue and 40% by the American Cyanamid Co.

●**United States.**—The Avisun Corporation will, it has been announced, renovate a plant near Newcastle, Delaware, to provide capacity of 10m. lb. a year of polyproplyene film and build an adjacent pilot unit with annual capacity of 500,000 lb. of polyproplyene continuous filament and staple fibres. The concern, jointly owned by American Viscose Corporation and Sun Oil Co., said the film unit would be located in an Aviscowned plant.

●**Canada.**—There is little hope of an early settlement of the strike of members of the Oil, Chemical, and Atomic Workers' Union at the Crown-owned synthetic rubber Polymer Corporation, according to Mr E. Taylor, mediator appointed by the Federal Government.

●**United States.**—The Federal Trade Commission has alleged that 15 US tyre and tube manufacturers and two trade associations — virtually the entire domestic industry—have been conspiring to fix prices on sales of tyres and tubes in violation of US law.

●**Malaya**—Moves to step up Malaya's 10m. Malayan dollar a year rubber research programme have been announced in Kuala Lumpur. The head of the programme, Sir Geoffrey Clay, is to visit Britain and the United States to meet leaders of the industry engaged in research and development of natural rubber. Since his arrival in April, Sir Geoffrey has been studying various aspects of the industry including research units in Malaya. Malaya will seek co-operation and co-ordination with various research groups in Britain and America, according to a spokesman for the research organization.

●**United Kingdom**—Monsanto's polythene plant at its new factory at Fawley, is now in production. Using a high pressure process it is making a range of polythenes at an initial rate of approximately 10,000 tons annually. The factory has cost some £3½m. to date.

●**Roumania**—A £7½m. contract for the design and supply of a tyre factory in Roumania, has been secured by Rustyfa. The factory will be capable of producing annually 1m. tyres and tubes for trucks, buses and cars, ½m. for motor cycles, and 1½m. for bicycles. Dunlop Advisory Services are again advising the consortium.

●**United Kingdom.** — A laboratory assistant at Ioco Ltd., Glasgow, was killed in an explosion on June 13. It is thought that the man, David Bennett, aged 23, had been cleaning a suit with inflammable fluid and then put it in an oven to dry where a concentration of fumes caused the explosion. The laboratory was damaged.

'It all depends what yer mean by luck—there's no money but there's a couple of thousand lengths of sticky rubber!'—444

Paris Tyre Symposium

SOME PAPERS SUMMARIZED

THE International Tyre Symposium organized by the Institut Français du Caoutchouc took place on May 20, 21 and 22. It was well attended, produced a number of interesting papers and discussions, and the general arrangements were excellent. Delegates were welcomed by Monsieur de Lauzieres, president de l'Institut Français du Caoutchouc, whose speech, given first in French, was then translated into English, German, Italian and Russian. The conference, he said, was a logical consequence of the one organized by the Rubber Stichting in Holland in 1952. Two hundred people were attending the present conference, of whom half came from countries outside France, and there were twenty-one lecturers from nine different nations. Those attending had come from Russia, Czechoslavakia, Great Britain, Holland, USA, Germany (West and East), Finland, Sweden, Switzerland, Belgium, Spain, France, Italy, Luxembourg and Thailand.

The international nature of the proceedings was well illustrated in the subsequent papers and discussions. The half dozen or so Russian representatives spoke only Russian, which meant that their speeches could be understood by very few of the audience. Most of the German and Dutch representatives present spoke in excellent English, but the British representatives were by no means outclassed, for most of them spoke in French that was at least comprehensible and one—Dr D. Tabor of Cambridge—explained his paper not only in French, but also in Russian.

The full programme of the Symposium was published in *RJIP* April 25 1959. At the conclusion of the final session, Mr M. Julien, Etablissements Paulstra, France, summed up the Symposium, after which delegates and contributors attended a reception given by the Institut Français du Caoutchouc.

Influence of Carcase Structure on Tractor Tyres

Summary of the paper read by C. Mazza, Laboratoire Pirelli, Italy.

It was often necessary, said Dr Mazza, for agricultural vehicles to run on roads which brought up difficulties on the removal of mud and the lack of good tractive contact. A new tyre carcase had been developed where the old angle cord construction had been replaced by one with inner plies round and outer plies along the length of the tyre. The tread surface was also much wider by reinforcing it thus giving a flat tread with a wider angle of contact.

The normal angle cords moved to and fro but did not lose their alignment with the centre. With the new radial construction tread movements made the cords fan out. The tread length remained practically constant. A new tyre was more readily deformed and hence the area in contact with the road was increased. These findings had been confirmed not only in Italy but elsewhere and the new tyres could be retreaded just as well as those made according to the old system.

Study of Friction on Lubricated Surfaces

Summary of a paper read by Dr D. Tabor, Cambridge University.

When the rubber surface of a tyre travels over a projection, hysteresis losses occur. A practical demonstration of this was given using two rubbers of the same hardness but of different hysteresis. Where the rolling was very slow the hysteresis loss was high. More work was done and therefore rolling was more difficult. This was shown by bouncing steel balls on the two pieces of rubber.

The second case considered was what happened in the presence of a good lubricant. Here, there was a distinction between rolling and sliding but sliding hysteresis should again be the deciding factor, the same effect should be seen as in free rolling. In both rolling and lubricated sliding, most of the friction was due to hysteresis losses in the rubber. Similar experiments might be done with cones. If the point of the cone was not sharp, friction was mainly due to hysteresis losses but where the cone angle became sharper, tearing occurred. Friction might be increased even on lubricated surfaces by using a rubber of high hysteresis. These experiments were done at a low speed but with very good lubricant. At higher speeds the relation still held provided the cones did not tear the rubber surface, even if the rubber was lubricated with water. A friction coefficient might be increased from about 0.1 to about 0.3 by using a rubber of high hysteresis loss.

This was shown by sliding blocks of rubber on a rough lubricated surface held at an angle. The rubber of low hysteresis slid down such a surface much faster than on one of high hysteresis. When, however, the same blocks of rubber were run down a grooved surface parallel to the grooves, the difference was negligible but when run across the grooves there was a big difference. The question therefore was, could this information be used by the tyre industry.

Free rolling friction was also high. Hysteresis loss was not dependent on the surface but the free rolling friction was. Therefore with a fine textured surface, free rolling friction might be improved. Hysteresis loss occurred throughout the tyre and it might be possible to make a tyre having a high hysteresis loss tread and a low loss carcase. Hysteresis losses in free rolling depended on the width of the region of contact and if the width of contact was made narrower the free rolling friction was thus reduced. These ideas were put forward, said Dr Tabor, for the consideration of the tyre industry.

Recent Researches on the Effect of Hysteresis of Rubber on its Resistance to Slipping

Summary of a paper read by G. G. Giles, Road Research Laboratory Department of Scientific and Industrial Research.

The lecturer dealt only with wet surfaces and considered the relation between hysteresis loss and friction, and also the effect of temperature.

The effect of temperature differed from surface to surface. As the hysteresis losses rose with the temperature so the friction increased. The same effect might be obtained by using a rubber of high hysteresis and the higher friction was obtained from rubbers with the higher hysteresis losses.

About 2,000 experimental results had been collected over a period of about four years. At any temperature there was a wide range of results but these, nevertheless, showed a general trend. Rough, open textured surfaces gave the best results. It had been shown that slipping in wet conditions caused damage to the rubber well

below its surface; this was because heat developed by hysteresis below the surface of the rubber. There was not much difference in frictional properties between smooth and patterned tyres on two different surfaces but there was a difference when rubbers of high hysteresis were used.

Opening the discussion on the two papers Mr V. E. Gough (Dunlop Research Centre) said that the theories of Dr Tabor and Mr Giles would not stand investigation. A hysteresis loss must appear as heat and if hysteresis were the only factor a car travelling at 70 m.p.h. would not be able to stop without the tyres blistering or blowing out.

The hysteresis losses were said by Dr Tabor to be independent of the height of the cones. The energy loss was however proportional to the height of the asperities. The forces considered by Dr Tabor were relatively small. He had shown an experiment which illustrated driving a tyre over bars. Butyl had a higher friction than natural rubber on all surfaces but this was not due to hysteresis. The forces considered by Dr Tabor were small in comparison with drag. Investigation on the wear of tread patterns showed that there was a difference in cross friction in the two directions; area was far more important than hysteresis.

Dr Schallamach, BRPRA, raised the question of the effect of drainage and temperature. In reply, Mr Giles said that a rough-looking surface could behave as if it were smooth—the size of the surface projections was most important.

In regard to the effect of temperature, experiments with bouncing balls were not very good. Frequency should also be taken into account but a detailed analysis of the results had not been done. Drainage had not been mentioned because a water film always remained and it was there that the hysteresis effect came in. It had so far not been possible to break through the film of water between the surfaces. Dr Tabor agreed that increase in area increased the friction but if it was not possible to remove the water film then hysteresis effects had to be considered. They comprised two factors; the amount of deformation and the nature of the rubber.

Dr Schallamach said that hard rubber was less indented than a soft rubber. One ought to work with a loss analysis determining the modulus by the Fournier series.

Mr Van der Bie (Shell Plastics, Holland) asked what happened on braking. Dr Tabor replied that this was not known. In the case of a locked wheel nearly all the frictional work was liberated at the surface. On rough surfaces there were bulk effects. The real area of contact of the tyre with the road was not continuous but in isolated small areas. The friction as measured might be, say, 0.15 of which hysteresis accounts for 40%. By using rubber of higher hysteresis this might be raised to 80%.

Mr Gough repeated that if all the energy was turned into heat, the tread would be entirely burned up. He promised to give figures in his printed contribution to the discussion.

Further summaries of papers will appear in a later issue of *RJIP*.

A Whale of a Rubber

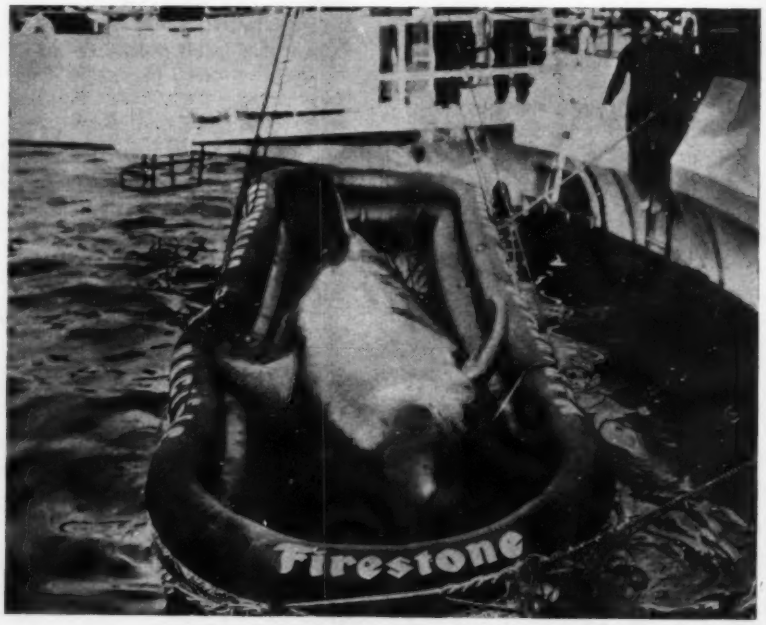
3,000 POUNDER CAUGHT WITH FIRESTONE BOAT

THE Firestone Tire and Rubber Co. in America recently assisted in promoting what is described as one of the biggest romances of the age. Three thousand pounds of blubber—male whale type—were conveyed, with due ceremony, to the domain of 'Bubbles,' famed female whale of California's Marineland, the world's largest Oceanarium, where it is hoped that the two will produce the first whale born in captivity.

To achieve the capture, Marineland officials asked Firestone to build a suitable raft to do the job and a 24ft. neoprene-coated nylon fabric 'boat' resulted.

The men working out of the Oceanarium sighted the whale 15 miles from Marineland, and used a 'trade secret' process to get him. This process, however, allowed them but four minutes to get the deflated raft under the 17ft. pilot whale and inflate it with the three CO_2 bottles provided.

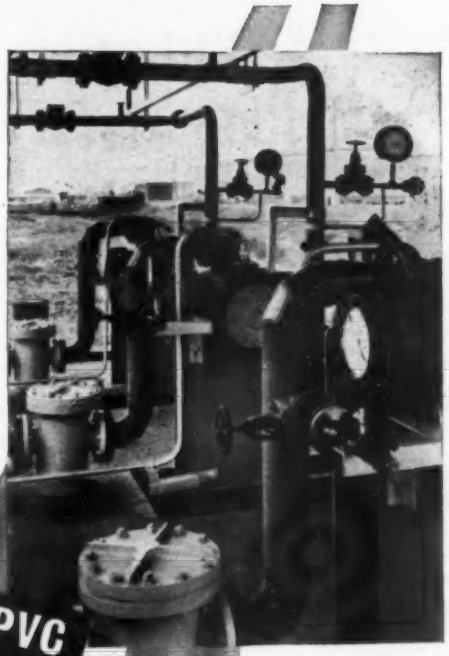
The 24ft. long rubber raft easily withstood the long tow back to Marineland. And then, as 'Bubbles' watched expectantly, her new companion was released and sunk slowly to the bottom. After a minute or so he began searching the tank in an inspection tour, apparently unharmed from his experience.



NON-SKID ROAD SURFACING

TRIALS are being performed in the UK by the Shell Chemical Corporation on a new non-skid road surfacing material containing epoxy resin. A zebra crossing at Egham, Surrey, has been surfaced with a layer about one-eighth of an inch thick. The composition of this material, which is expected eventually to be used also for surfacing ships' bridge decks, parts of roads which are subjected to heavy loads or where skidding is likely, has been developed by Shell in the US for four years.

Further details of the development will appear in a future issue of RJIP.



High Impact PVC tubing made by Extrudex Ltd, Bracknell, using Geon RA170. Photographs taken at The British Petroleum Co. Ltd Refinery, Isle of Grain.

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the High Impact PVC

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International Plastics Exhibition

PRELIMINARY REVIEW

THE International Plastics Exhibition at Olympia, London, was opened on Wednesday by Mr Reginald Maudling, the Paymaster General, who had some stimulating things to say about the progress and potentialities of the plastics industry. There is certainly much at Olympia to excite the interest alike of the technologist and the layman. Notable developments are to be seen not only in machines, in particular high speed injection moulders of smaller capacities and some interesting vacuum forming machines, but also in raw materials for the industry and in techniques.

The four pages comprising this review of machines, materials and equipment on show can best be described as a preliminary. Circumstances, referred to in 'Notes of The Week,' preclude, for the time being, the devotion of further space to what has already proved to be a first class show.

Moped saddle and cinema seat arm pad—vacuum formed PVC with polyester foam support moulded to shape, Lintafoam Ltd.

Crystalate (Mouldings) Ltd. and Mica Products Ltd.—21A

Crystalate (Mouldings) Ltd., Mill Lane, Tonbridge, Kent, are illustrating on their stand the production of items by the compression moulding method. The company produces a range of articles covering the industrial and domestic, electrical and engineering fields, the motor vehicle trades, the aircraft industries, fancy goods, radio and television, etc. The associate company, Mica Products Ltd., on the same stand, produces mainly by the injection moulding method in all of the materials now available in the thermoplastic range. The company specializes in the fabrication of tubes, bobbins, etc., in synthetic resin-bonded materials and in connexion with the tubes a wide range of standard mandrels are available. Mica Products are equipped also for the production of articles by vacuum form process and, as an additional service, are able to offer the metallizing of plastic articles by vacuum coating.

Birkbys Ltd.—27

A large variety of 'Elo' compression, transfer and injection mouldings is on view on the stand of Birkbys Ltd., Liversedge, Yorkshire. 'Elo' mouldings are made in phenolic and thermosetting moulding powders, such as urea, melamine, alkyd and also in dough moulding powders. In addition to mouldings and moulding powders, the 'Elo' range also includes phenolic resins for all bonding, laminating, abrasive and frictional material applications; resins for textile paper tubes and bobbins, anti-friction resin for fabric bearings; and cements, lacquers and insulating varnishes.

Reeves and Sons—2

A new range of translucent pigments dispersed in a polyester resin has been made available and is being shown by Reeves and Sons Ltd., Enfield, Middx, as part of the stand design. These pigments are primarily for use with reinforced plastic roof lights and show remarkable fastness to light, even when used in low concentration. Dispersed pigments for colouring PVC and polyester resins are supplied in various media, such as DOP, DAP, DBP, etc., and also in special media by arrangement, and considerable work has been carried out to improve the range of colours available, especially colours to British Standards Specifications.

Stanley Works (GB) Ltd.—92

Stanley Works (GB) Ltd., Rutland Road, Sheffield, is exhibiting the following: Shapers which will file, shape or smooth any plastic and a wide range of other materials from wood to mild steel. There are three styles of shaper, the shaper plane at 15s. 6d., the shaper file at 12s. 6d. and the shaper junior for one-handed work at 7s. 6d.; the 'Giftmark' thermoplastic marking unit, which will emboss, deep print or mark any text, crest, trade mark, etc. The 'Giftmark' is suitable for marking a wide range of materials and is widely used in the gift and fancy goods trade. Both hand and production models are available. The Stanley 'Discut' is a new machine with an electrically powered non-clogging cutting disc. It readily cuts, trims, shapes or forms all commonly used plastic materials.

Mr Stuart Davies, home sales manager, and Mr Martin Bradford, who are on the stand of Stanley Works (GB) Ltd.

'Neutrostat' air gun for the neutralization of irregular - shaped plastics. Sheridan Croxted Ltd.

Whiffen and Sons Ltd.—407

New formulations for microcellular rubber soles and heels in a variety of shades are featured by Whiffen and Sons Ltd., Willows Works, Derby Road, Loughborough, Leics. Other products are: Nylon 11 for injection moulding, extrusion metal coating film and brushes; free blown PVC; cellular rigid PVC; a range of chemical blowing agents for expansion of plastics and rubbers; rubber sealing strip, wire and cable coverings, etc.; and some finished products.

Portland Plastics Ltd.—327

Portland Plastics Ltd., Bassett House, Hythe, Kent, are featuring plastic tubing and surgical sundries.

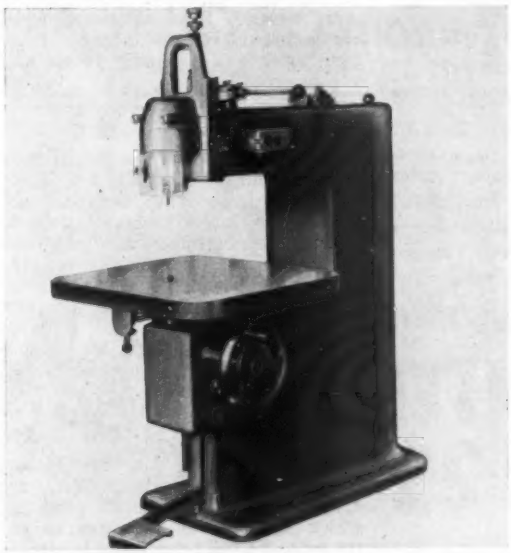
Danckaerts Woodworking Machinery Ltd.—95

Two machines comprise the exhibit of Danckaerts Woodworking Machinery Ltd., 2, 4 and 6 East Road, City Road, London, N.1. The rolling table saw-bench-type ZOLNE DC is a general-purpose high-precision machine suitable for cross-cutting and squaring off panels. The saw spindle is vertically adjustable and can be fitted with a canting action if required. The rolling table is of large dimension and accurately guided on ball-bearing wheels running on Vee runners. It carries a long-scale fence with a distance stop. The high rotary speed (20,000rpm) of the tool on the other machine, the router, gives excellent finish on plastic and allied materials, especially when used in conjunction with tungsten carbide-tipped tools. This machine is driven by a standard 5hp motor giving ample power and eliminating the need of elaborate high-frequency electrical equipment.

Dowding automatic fast-cycling injection-moulding machine. Dowding and Doll Ltd.

Dowding and Doll Ltd.—39

The latest Dowding Series II high-speed injection-moulding press are shown by Dowding and Doll Ltd., 346 Kensington High Street, London, W.14. Fully automatic, several of these machines can be tended by the same operator. They have been developed especially for the rapid production of small, accurate, high-quality mouldings and are designed to operate at high cycling speeds—1,200 per hour, dry—so that optimum output is obtained by fast operation with moulds having comparatively few cavities. Also featured are two 'Westminster' injection-moulding machines. Simple, inexpensive, but very robust, these machines have found much favour for short run, experimental and pilot production. The injection cylinder is fitted with a spreader to provide rapid, uniform heating of the material. A special chromium-plated cylinder, ram and injection nozzle are available for moulding PVC, and for nylon a special non-drip nozzle is supplied with an additional heater band and 'Variac' auto-transformer to control the heat output.



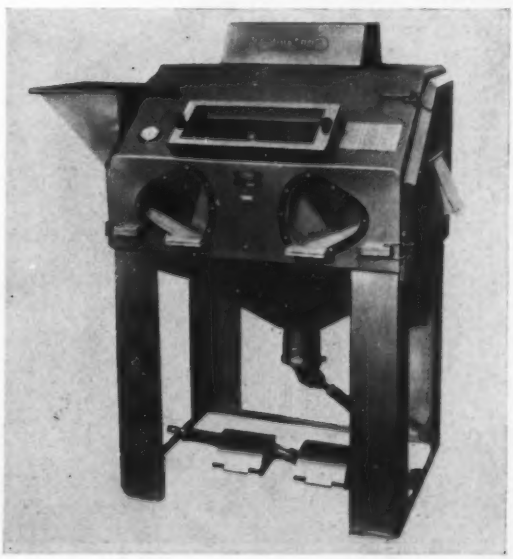
Five - h.p. router for plastics and allied materials. Danckaerts Woodworking Machinery Ltd.

Stanley Smith and Co.—77

The well-known range of 'Vitrone' vinyl sheetings manufactured by Stanley Smith and Co., Worple Road, Isleworth, Middlesex, including three important smaller items, especially in the packaging trade.

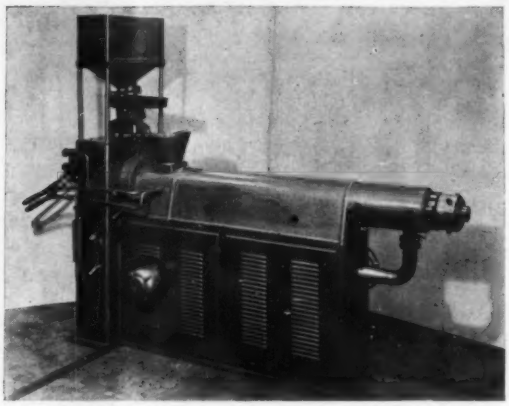
John Kimbell and Co. Ltd.—88

On behalf of the principals, Bucher-Guyer, of Zurich, John Kimbell and Co. Ltd., 39 Victoria Street, London, S.W.1, is showing the following machines: Two 'Tavannes' automatic moulding presses designed for the production of a wide range of small thermo-setting mouldings, with or without screw threads, using powder or pellet loading. The Bucher-Guyer press will be shown for the first time in this country. It is a high-precision press suitable for conventional compression moulding and for transfer, and machines of this type are now being used extensively on the Continent for the manufacture of plastic products of the highest quality and to most exacting specifications. 'Formvac' vacuum-forming machines, made by Hydro-Chemie Ltd., of Zurich, Switzerland, are represented by the U-5, suitable for the moulding of large articles on an industrial scale, and by the 'Junior' for the moulding of



SBP/40 plastics deflashing machine. Guyson Industrial Equipment Ltd.

additions, clear calendered film, unplasticized rigid sheet for deep-draw mouldings, and high-impact rigid sheet for chemical engineering work, etc., are featured by the company. 'Vitrone' unplasticized rigid vinyl sheet calendered and pressed for vacuum forming and pressure moulding for deep-draw sections are available in a wide range of colours and glass clear, including an opalescent finish for corrugated sheeting and modules for illuminated ceilings, etc. Flexible vinyl sheeting in the same material, glass clear, pressed and calendered, are shown for use in the motor car and packaging industries and for advertising display.



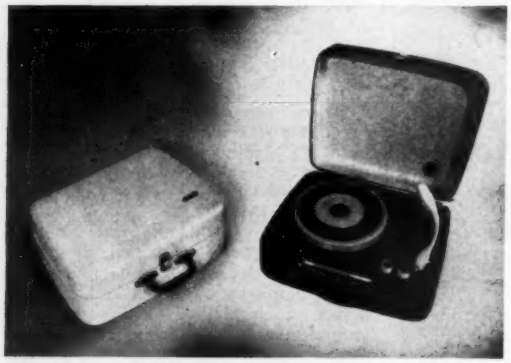
The 90mm. extruder 20 : 1. Burtonwood Engineering Co. Ltd.

H. C. Slingsby Ltd.—87

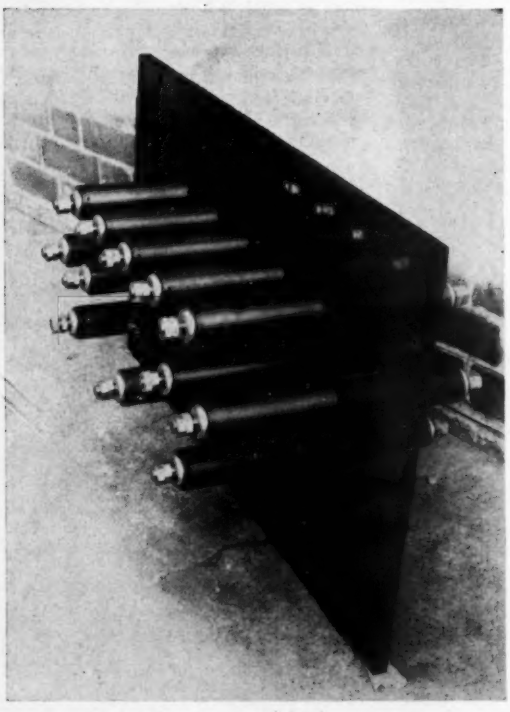
Trucks, ladders, etc., for materials and finished products handling, are featured by H. C. Slingsby Ltd., 89, 95 & 97 Kingsway, London, W.C.2.

Prestfibre Ltd.—100

Compressed fibre mouldings preformed under pressure and vacuum by the 'Prestfibre' and 'Pimfibre' processes are displayed on the stand of Prestfibre Ltd., 359 Canal Road, Bradford, 2, Yorks. The raw material of these mouldings is invariably fibrous, but the company emphasizes that the mouldings should not be confused with papier mâché. Mouldings manufactured under these processes are light in weight, shatterproof, resilient to impact, and impervious to corrosion. They are part insulative to sound, heat and electricity and stable under conditions of heat and moisture. Both derive great strength from their contoured shapes and the resin addition to 'Pimfibre' makes it especially tough and impact-proof.



Record player cases made of 'Prestfibre' covered with leather-grained PVC. Prestfibre Ltd.



Multi - way terminal board of 'Kite' brand 'Tufnol' sheet and tube. Tufnol Ltd.

Kemitype Ltd.—401/2

Kemitype Ltd., 8 Chase Road, Park Royal, London, N.W.10, are showing their bag-making machine, the 'Unimat.' This is specially designed for easy exchange and fitting of all the appliances necessary for its versatile range of bags and shapes. The combination of various sealing methods and the centralized electric control for all appliances fitted allows for the producduction, in one operation, of manifold types of bags and shapes.

Formica Ltd.—206

Formica Ltd., De La Rue House, Regent Street, London, W.1, are exhibiting all their plastics products, which range from laminates to extrusions. Formica decorative laminated plastic, manufactured from sheets of paper impregnated with selected resins, are shown and examples of the interlaminated 'Artwork' process are illustrated. By this technique artists' designs and other decorative effects can be incorporated into the Formica sheet during the manufacturing process. Curved surfaces, a new development, are made possible by the post-forming technique. With the introduction of a special grade which has the identical qualities as standard Formica it is possible to curve the material to very tight radii. A 'Vanitory' unit is amongst a number of items of bedroom furniture exhibited and examples of industrial laminates are on view. Other products will include 'Delaron' chair sets in a range of 11 different colours, extruded products, including fire hose, a series of transparent extruded containers, extruded piping and rod in polythene and polystyrene and several types of PVC piping.

Continued on page 958

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VIEWS and REVIEWS

Economics of Corrosion

IN opening the discussion on 'Economics of Corrosion,' a subject on which the Corrosion Group of the Society of Chemical Industry met recently (March 18 1959) to hear Mr A. Keynes speak, Dr W. H. J. Vernon—whom, I think one may call an outstanding doyen of modern corrosion research—referred to the speaker's 'stimulating and provocative address.' Thus, for example, he (Mr Keynes) is reported (*cf. Chemistry and Industry,* May 30 1959, 666) as remarking that 'Corrosion prevention would effect a reduction of our exports and thus enable us to reduce export prices; finally, the loss of goodwill among our customers would be avoided.'

I may be wrong, but I take this to mean that the better the quality of our exports as regards resistance to corrosion, the less of such materials will be required, and therefore, the greater their prestige and the greater the demand, and this should enable us to reduce prices. I should not care to have to extrapolate corrodibility against weight or value. However, the quotation as above was the last sentence in a paragraph which postulated that:

'Many factors had to be taken into account in unravelling the national economic aspects of corrosion control. Here, not only corrosion literacy but also economic or cost literacy was required. Corrosion prevention had to be viewed in the light that a fully extended economy would almost inevitably mean a constant struggle to prevent an unfavourable balance of payments.'

It is all very intricate, but there are other sections in the address and discussion which are more readily comprehensible to the non-economist.

Ore Reserves

Estimates, the speaker said, had been made of the time to exhaust the earth's metals. 'Iron would last about another 825 years, but tin, zinc, lead, and copper might be exhausted within 50 years. The fact that there were greater reserves of ferrous than of non-ferrous metals, and that the former were cheaper, explained the wisdom of preserving iron,' and '. . . control of corrosion had its part to play in mitigating the increasing diversion of effort to win metals.'

The Choice for Commercial Firms

To do or not to do something or nothing about corrosion was always a choice for a commercial firm, and 'occasionally this latter was the more economic choice.' For example:

'An economic appraisal of the use of cathodic protection for tankers indicated that something rather less than perfection in corrosion prevention was the need: for, advances in ships' propulsion brought more rapid obsolescence, so that a combination of x% protection for no longer than y years was the compromise to aim at.'

The discussion on the address was full of interesting views, and it is quite out of question here to do more than to refer to a very few of the points raised. Certainly this is a report which must be read *in toto* if one wishes to gain any overall opinion. However, here is a very modest selection of views.

Dr W. H. J. Vernon took the view that there are two approaches to the costs of corrosion. 'One can either assess the aggregate or gross costs to the community, or evaluate critically internal interrelated factors on which the ultimate economy depends. The former can at least be attempted by the non-economist; the latter call for expert analysis by the economist, and the use of techniques discussed by Mr Keynes in his stimulating and provocative address.' . . . And, in regard to overall considerations, Dr Vernon entered two pleas: the first was to the economist 'to have a wholesome respect for the cumulated findings of corrosion research'; and the second—to the corrosion-executive 'to realize there is much to be learned from the economist. . . .'

Dr U. R. Evans, *inter alia,* discussed the question as to what extent it would pay to use more paints or protective coats, if thereby the recoating interval could be prolonged. A very interesting point arose in respect of metals in short supply. Thus, at one time platers were rationed for nickel; this meant thinner coats, and so a shorter life for the plated articles, 'which then passed prematurely to the scrap heap,' carrying with them 'whatever nickel was left.' Probably, in the long run, this increased the consumption of nickel, and if only nickel economy were in question, one could evaluate by means of no more than two equations (a) that representing life as a function of thickness, and (b) that of the average consumption over the review period in terms of life and thickness. *But,* if the value of the basis metal, and original fabricating costs must be taken into account, 'the mathematics are less simple' but not insoluble.

The complexity of the questions arising were exemplified by the reference by Mr R. Mansford to the protection of steel by means of aluminium. One ton of aluminium will protect many tons of steel, 'and steel when erected has a greatly enhanced value.' This seems to indicate that it is worthwhile to protect the more prolific metal with the scarcer one. But that is not the whole story, because (in the factory) it is not only corrosion of the plant, but also corrosion of the structure housing the plant that has to be considered. And, Mr Mansford concluded, the distribution as well as the amount of the corrosion has to be considered.

A matter which clearly shows the complexity of the corrosion problem was the reference by Mr S. C. Britton into the conservation of less abundant materials as one object of research into preservation.

Rubber Versus Plastics

(in footwear and floor tile)

Rubber Age for May 1959 (Vol. 85 No. 2) reports on a panel debate held before the Quebec Rubber and Plastics Group on 'Rubber versus Plastics' in the Footwear and Floor Tile Industries, which is described by our con-

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

temporary as 'one of the most successful meetings held last year' by the said group.

Rubber Age adds that 'the editors of *Rubber Age* thought the opposing positions of the speakers emphasized certain points which would interest our readers as much as they did the audience who heard the debate.' Moreover, says *RA*, the panelists have organized their thoughts into a form suitable for publication, and their revised remarks 'are presented herewith.'

The Protagonists and Views

In a brief introductory statement we are informed that: For the *Footwear* industry Hugh Beland (Dominion Rubber Co. Ltd.) advocated the use of rubber, and A. Beverley Lewis (British Rubber Co. Ltd.) the use of plastics.

As regards *Floor* tiles Cliff Lamb (American Biltrite Rubber Co. (Canada) Ltd.) supported the use of rubber, and Ian Maclaine (Dominion Oilcloth and Linoleum Co. Ltd.) was for plastics.

The moderator of the symposium was O. R. Huggenberger (Dominion Rubber Ltd.).

General

The symposium consisted of *first:* talks by the advocates (as above) for rubber and plastics respectively in the Tiling field, and then the *pro* and *against* men discussing Footwear. Finally we have the Questions and Answers section.

Tiling

In commencing his talk *in favour of rubber,* Lamb admitted that the plastics compounder has numerous advantages, especially as regards obtaining transparent or translucent goods, but with rubber the necessity for loading does away with this advantage. Therefore the rubber man is restricted almost entirely to the original method (*i.e.*, marbleizing at the calender and press curing). It may be impossible (visually) to determine whether a piece of dark, unused, and freshly waxed rubber tile was made yesterday or 30 years ago, *but:* quality-wise the story is vastly different. The first major step forward came with the introduction of high styrene resin. The incorporation of this material improved hardness and resilience, but even more important, it facilitated production so much that rubber tile was no longer a '"Speciality" product.' The next advance was when non-staining styrene rubber became available . . . 'and now customer complaints attributable to sunlight exposure are a thing of the past.' Cliff Lamb concludes: 'These and numerous minor improvements give us the product we have today—a flooring unsurpassed for resilience, comfort, and safety—a flooring which, if properly maintained, will give a lifetime of service. These qualities compensate fully for the lack of scope in design a rubber compounder has when competing with plastics in the flooring field.'

In his contribution in *favour of plastics* MacLaine rests his case mainly on the Vinyls, and the statistics quoted are definitely impressive, both positively and in comparison with the 'rubber' figures. Thus, it is mentioned that established flooring manufacturers in the United States have between 1950 and 1956 increased the consumption of vinyl resins from 10 to 65 million lb. Coming to the reasons for the 'ready consumer acceptance' of vinyl flooring MacLaine suggests:

1. Brilliant clean colours are available in vinyl flooring.

2. Lowering resin costs have placed vinyl tile in a competitive price range with rubber and heavier grades of linoleum.

3. Outstanding chemical resistance permits a wide range of application, and

4. Vinyl-asbestos tile has proved that it may be successfully applied over potentially damp concrete, where, formerly, asphalt tile was the only satisfactory product.

MacLaine sums up in this way: The future of plastics in the flooring field is assured. Whether polyvinyl chloride will become the main resin of the flooring industry is still in doubt. However, this family of resins is firmly entrenched and great future growth is indicated.'

(NOTE: I propose to deal with *Footwear* and 'Questions and Answers' in my next batch of reviews).

Compounding for Heat Resistance

'BRPRA Technical Bulletin No. 3' issued end of May 1959 relates to 'Compounding Natural Rubber for Heat Resistance,' the authors of this interesting 23 page, elegantly produced, brochure being W. P. Fletcher and S. G. Fogg. 12 Tables and other matter give, in this small space, a great deal of practical information.

Results of Research

A few details of this research carried out by the British Rubber Producers' Research Association are referred to below, but the result, broadly, of the work, as is pointed out on the Title page, is that 'By careful selection of curing systems, protective agents and fillers, Natural Rubber can be compounded so that vulcanizates retain a high level of physical properties in air for eight weeks at 100°C. (212°F.), or for two weeks at 125°C. (258°F.).' It is added that as most of the tests upon which the bulletin is based were carried out on small dumb-bell test pieces, far longer lives may be anticipated for many rubber components which present a proportionately lower surface area for oxidative attack.

Compounding Methods

Under the above heading (p.2), the authors say that: In compounding Natural Rubber for maximum life when used at high temperatures the following techniques are indicated:

1. The use of a 'sulphurless' curing system; even very small proportions of elemental sulphur give inferior ageing.

2. The use of an antioxidant conferring high heat resistance.

3. The use of a dithiocarbamate as a protective agent; this is often formed *in situ* during vulcanization.

4. The use in some cases of an antioxidant of the type sometimes known as 'deactivator.'

5. The selection of an appropriate filler.

(For particulars of compounds for various purposes, particulars of cure, and of testing, etc., cf. the brochure reviewed herewith).

PHILIP SCHIDROWITZ

Questions Corner—77

(Second Series)

327. Give recommendations for safe storage and handling of nitrocellulose and solvents.

328. In the extrusion of thermoplastics what effect has the moisture content of the material?

329. What types of heating are used in extrusion machines?

330. In emulsion polymerization a class of materials known as modifiers is used. What are they?

(Answers next week)

Answers to Questions Corner—76

323. BS 2782: Part 3: 1957 is a collection of recommendations for the mechanical testing of plastics, and includes details on:

Tensile strength and elongation at break of thermosetting and cellulose acetate moulding materials, thermosetting laminates sheet, flexible polyvinyl chloride extrusion compounds and flexible unsupported polyvinyl chloride sheet.

Elastic modulus in tension of thermosetting moulding materials, thermosetting laminated sheet, and stress at 100% elongation, of flexible polyvinyl chloride extrusion compound.

Crushing strength of thermosetting moulding material using a cylindrical specimen.

Cross-breaking strength of thermosetting moulding material and thermosetting laminates sheet. These methods are for measuring the apparent surface stress in bend at fracture of rigid materials when subjected to a three-point loading. Cross-breaking strength is also known as flexural strength.

Shear strength of moulding and sheet materials.

Impact strength. Two methods are used and in one a notched cantilever specimen of standard dimensions is broken by a blow from a weighted pendulum and the loss energy of the specimen is measured. The other method is suitable for cellulose acetate moulding material in which a guided weight is allowed to fall on to the centre of a disc of standard dimensions supported on a ring.

Indentation tests for determining the softness, at 23°C., of flexible PVC extrusion compounds.

Tear strength of flexible unsupported polyvinyl chloride sheet. The angle test piece is used.

Copies of the Specification may be obtained from the British Standards Institution, 2 Park Street, London, W.1. Price 7s. 6d.

324. There are several polymers which are produced in bead form and which have important commercial applications.

Polystyrene is produced in this form as beads of relatively large size for injection moulding, although they may also be used for extrusion. Insoluble bead polymers, cross-linked with divinyl benzene, are also used in the preparation of ion exchange resins. The beads are swollen with an inert organic solvent and then sulphonated to produce cation exchangers. Alternatively, they can be chloromethylated and reacted with tertiary amines to produce anion exchange resins (Ind. Eng. Chem. 1952, *44*, 1796).

Expandable polystyrene beads are also used, containing a heat expanding agent, for the production of polystyrene foams.

Polymethyl methacrylate in bead form can be used as moulding powder and for the preparation of dentures, for which purpose a small bead size is necessary so as to obtain a uniform working product.

Polyvinyl chloride bead polymers have advantages for electrical applications because of their freedom from polar impurities, *e.g.*, emulsifier residues. Most vinyl chloride bead polymerizations use polyvinyl alcohol as the suspending agent and lauryl peroxide as the catalyst (Ind. Eng. Chem. 1953, *45*, 270).

Compared with polystyrene and polymethyl methacrylate bead polymers the polyvinyl chloride granules are opaque, with rather a rough surface, which is due to the insolubility of the polymer in the monomer.

Copolymers of vinylidene chloride and vinyl chloride, acrylic esters, etc., are manufactured by bead polymerization and used in the production of saran filaments, etc. (USP 2,445,970; 2,543,805; BP 575,616; 573,369; 595,551).

Polyvinyl acetates are prepared by bead polymerization and when copolymerized with small percentages of crotonic acid are used for paper and bookbinding adhesives (USP 2,657,189; 2,643,246; 2,676,938; 2,643,238).

325. In the formation of a monomer emulsion large interfacial areas are formed between the monomer and the water. A substance which lowers the interfacial surface tension will assist the formation of the emulsion and lessen any tendency towards coalescence. Soaps, for instance, are a class of material which will do this and they are referred to as emulsifying agents, or surface active agents. They may, of course, be cationic, anionic or non-ionic.

Emulsifiers for many purposes have been known for many years and the early work in connexion with emulsion polymerization has been reviewed in 'Synthetic Rubber'—G. G. Whitby—Wiley and Co., N.Y., 1954; Ind. Eng. Chem. 1933, 25, 1204, but it would appear that the first record of emulsifiers being micelle forming are not until about 1921 (BP 283,840).

The effect of the composition of the emulsifier has been studied and it has been shown that:

The polymerization rate increases as the chain-length of the saturated fatty acid soap increases (J. Pol. Sci. 1950, *5*, 191).

Unsaturated fatty acids, *e.g.*, linoleates, retard polymerization (Ind. Eng. Chem. 1948, *40*, 530).

Increased rate of polymerization can be obtained by the use of hydrogenated rosin acid soaps (Ind. Eng. Chem. 1949, *41*, 1626).

326. One of the main advantages of emulsion polymerization is that the heat of polymerization is easily removed through an aqueous medium of low viscosity. Also, the reaction is rapid at comparatively low temperatures to give products of high molecular weight.

Emulsion polymerization depends on the solubilization of the monomers to form an emulsion, in comparison with the dispersion of monomer droplets in suspension polymerization. It also differs from the latter in that polymerization does not take place in the droplets of the monomer but, to a great extent, in the monomer-polymer particles which arise in the aqueous phase surrounding the droplets.

The polymer formed in pearl polymerization is very similar to that obtained in bulk polymerization whereas that obtained by emulsion polymerization invariably has a higher molecular weight.

In emulsion polymerization there is a direct connexion between the amount of emulsifier used and the rate of reaction. The higher the amount of emulsifier the greater the rate of reaction.

(More questions next week)

'Copper inhibitor—useful when parking outside Olympia !'

MEN and MATTERS

A Review of People and Events

by George A. Greenwood

WELL, the International Plastics Exhibition and Convention opened at Olympia on Wednesday in a blaze of glory, and what a pity it is that exigencies of space, due to circumstances over which I and others here have no control, again prevent me from saying all that I would like to say about this significant event. The Convention will be taken care of elsewhere in various issues of the Journal, and so also are the purely technical aspects of progress and development in the manufacture of plastics, but what concerns me is the over-all picture of the Exhibition which, it is already clear, is making its impact both upon retail traders and the ordinary man-and-woman-in-the-street who are visiting Olympia.

One of the most interesting features is that the film shows to which I referred a week ago are certainly achieving their purpose in making the Exhibition more intelligible, as well as more interesting, to the general public. Then, of course, there is also available in the printed word a lot of information both about the history of the industry, its incredible growth, and the infinite variety of uses to which plastics are now put. For example, it is probably quite unlikely that until going to Olympia, one in a thousand of the visitors will have had any notion that plastics are about 100 years old, or how, in the crowded century since the discovery of the first of the series—celluloid—not only has a complex technology grown up with them, but that the tremendous range of materials which has been produced is continuously and, indeed rapidly, expanding.

Reminders

It is good for some of us, ourselves, to be reminded from time to time that much of the rapid increase in output, considerably over 10 times the amount in about 20 years, has been due to successful selling overseas, and that we go on quite well holding our own in foreign markets. I suppose that the fact that nearly one third of the 300 firms exhibiting at Olympia are from overseas can be taken as an indication not only of the way in which the use of plastic goods made at home has developed in this country, but of the natural desire of our friendly rivals abroad to get into the British market, and to extend their sales in competition with producers on the European Continent, and in North America.

Personally, I am not one given to being impressed by statistics, or to quoting them, for they can easily become tedious, but it is certainly an impressive fact to be told that in the diversity of the displays, some 12,000 different finished products are on show. I would take a level bet, after watching some of the obvious non-trading and purely inquisitive visitors, that they are seeing at Olympia plastics applied to purposes which they had never before realized, and probably never before imagined.

In particular, the general public has had its eyes wide opened by seeing some of these products actually being made. It would be impossible to think of anything more valuable for the industry in general than that its purposes and its uses should be so displayed.

A Notable Jubilee

Many memories must have been stirred by the announcement of last week's double jubilee in the world of rubber. It was the 50th anniversary of the United Sua Betong Rubber Estates, and the fifth decade of Sir John Hay's period of service which this year is also reached. It must be rare indeed that a man serves throughout the entire history of a company like this, and sees it expand to its present great dimensions. But that is what has happened in this case, and it must have been extremely pleasant for Sir John to be able to tell his shareholders that progress continues unimpaired.

For a long time it has been Sir John's custom not only to review the situation of this—one of the leading companies, its finances, and the position at the plantations, but also to tell us his views about the state of the industry in general, and to this extent his survey was again masterly. He naturally referred to the change in trade which has followed the considerable rise in prices, and the great increase in consumption which has so reduced stocks, and he had some wise and cautionary things to say about some circumstances which follow. For example, he pointed out that the practical remedy for a shortage of natural rubber is an increase in supply which may well be stimulated by current prices, but that if, to meet expanding demands, the increase is to continue into the distant future, that can only be accomplished by an increase in capacity.

A Woman in the News

An enterprising and attractive 41-year-old woman of charm will soon be seen a good deal in the plastics and associated industries. She is Mrs Margot Newlands, the only woman out of nearly 200 applicants for the post which involves running a new market research department for the Formica Company, and she got the job. I am told that out of the 200, about 60 were interviewed and four short-listed.

Mrs Newlands, an Oxford-trained economist, I am told, 'sailed through every test.' She is the wife of Mr Keith Newlands, sales director in the Cossor radio and TV business. They have two sons, aged six and four.

TV at IPE

Industrial people in the North and West of England and in Wales who are unable to come to London for the International Plastics Exhibition will, I understand, be able to pay it a visit through the medium of television.

Granada TV Network Ltd., in close co-operation with the organizers of the Exhibition, have planned this service to industry which will permit executives, businessmen and everyone interested in plastics to see many of the new products, machines and materials which they otherwise would have missed.

Transmissions will take place direct from Olympia on 23 and 25 June. Each will run for half-an-hour, from 12.30 p.m. to 1 p.m. and will be in the form of telerecordings made on the same day, before the Exhibition opens to the public.

Birthday Honours

Amongst business men to receive awards in the Birthday Honours list were the following: Mr David Bowes-Lyon, a director of the Dunlop Rubber Co. Ltd., and other companies, who receives the KCVO; Sir William Palmer, chairman of the European Free Trade Committee and of the British Man-Made Fibres Federation (GBE); and Mr Thomas Clyde Hewlett, a director of the Anchor Chemical Co. Ltd. (CBE).

Industry Intelligence

Owing to the restrictions on space which have arisen as a result of the dispute in the printing industry, the following features have been omitted from this issue of RJIP: Industry Intelligence, Patent Specifications, Rubber Statistics, Trade Marks, and New Companies.

Latex Engineering Co.

The Latex Engineering Co. has announced a change of address, from June 12, as follows: 4 Clements Inn, London, W.C.2. Telephone CHAncery 2401.

R. T. Cooke

Mr R. T. Cooke, a director and former chairman of Francis Shaw and Co. Ltd., engineers Manchester, died on Friday June 12 at the age of 82.

INTERNATIONAL PLASTICS EXHIBITION

Continued from page 952

Pritchett and Gold and EPS Co. Ltd.—417A

The stand of Pritchett and Gold and EPS Co. Ltd., Dagenite Works, Dagenham Dock, Essex, features two porous plastics—new 'Vyon' and the well-proved 'Porvic.' 'Vyon' is produced from high-density polythene of the Ziegler type and it has already found applications in air and liquid filtration, air fluidized powder conveying and as aeration pads and electrolytic diaphragms. Although 'Vyon' is tough and flexible, it is also light and easily fabricated. It is machinable, and can be welded and drilled. A permeable material of medium pore size, its permeability is uniform and can be controlled in manufacture. 'Porvic,' a micro-porous plastic, was developed primarily to replace conventional wood separators in electric storage batteries. It is a permeable material of very fine and uniform porosity made from PVC of high molecular weight without the addition of a plasticizer. It can be supplied in sheets of 0.030in. thickness and up to 36in. x 12in. in size. The porosity of the material enables sheets to be joined, if necessary, by a variety of cements, a feature which greatly widens the scope of application.

On the stand of the Burtonwood Engineering Co. Ltd.—*Left to right,* **F. Price, technical sales, A. Anderton, chief electrical engineer, W. T. Moss, chief mechanical engineer, Mrs L. Garvin, secretary/interpreter, J. Clare, service engineer, H. V. Rowlands, director, A. H. H. Unsworth, technical service engineer, J. G. Dutton-Forshaw, technical sales**

On the stand of Bakelite Ltd.—*above, left to right:* **Mr John Lassen, sales manager, extrusion and calendering materials; Mr F. M. Papirnik, marketing manager, 'Warerite'; Mr B. Harris, manager, laminated sales department; Mr C. Rockhill, sales manager, bonding and surface coating resins.** *Below:* **Mr B. Francis, sales manager, moulding materials department; Mr George Langford-Allen, chief area representative, southern area, bonding and surface coating resins; Mr G. Morgan, chief area representative, southern area, extrusion and calendering materials; Mr P. Wilson, chief area representative, southern area, laminated sales department.** *Left:* **Mr H. Fussell, chief area representative, southern area, moulding materials**

Scientific Pharmacals Ltd.—323

The 'Kerodex' range of barrier creams for industry and the 'Keroclense' range of specialized industrial skin cleansers will be featured by Scientific Pharmacals Ltd., 1 Eden Street, Hampstead Road, London, N.W.1. 'Keroclense 22,' being shown for the first time, is specially designed to remove quickly and easily all deposits of adhesives and resins which contaminate hands in the course of manufacturing processes.

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APPOINTMENTS VACANT (continued)

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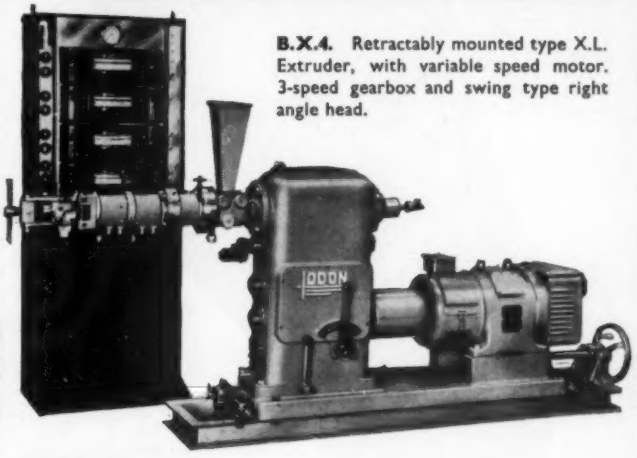
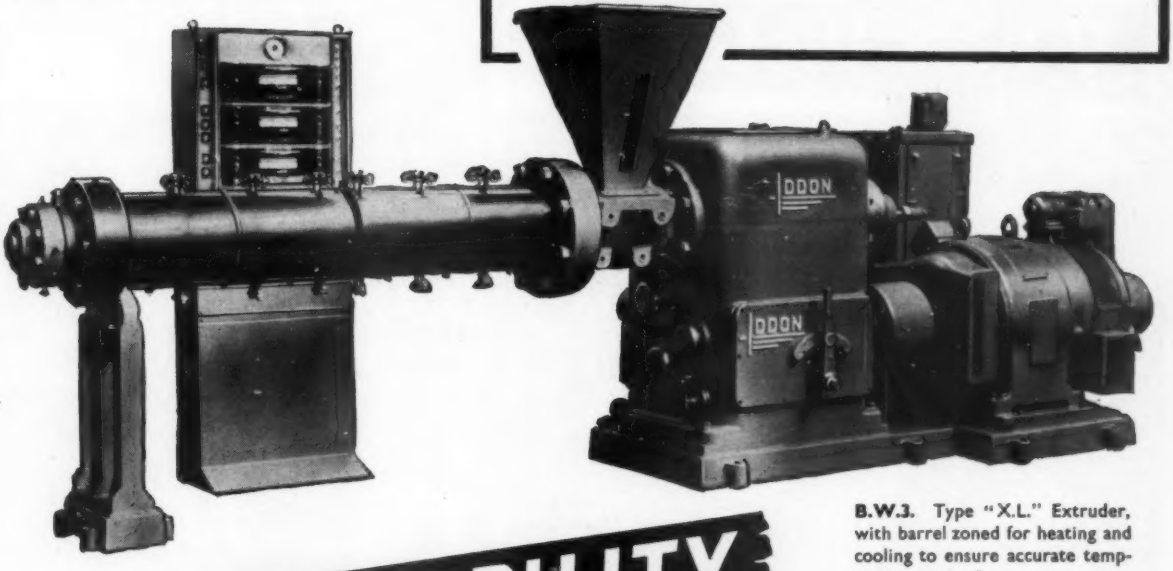


B.X.4. Retractably mounted type X.L. Extruder, with variable speed motor. 3-speed gearbox and swing type right angle head.

ADAPTABILITY



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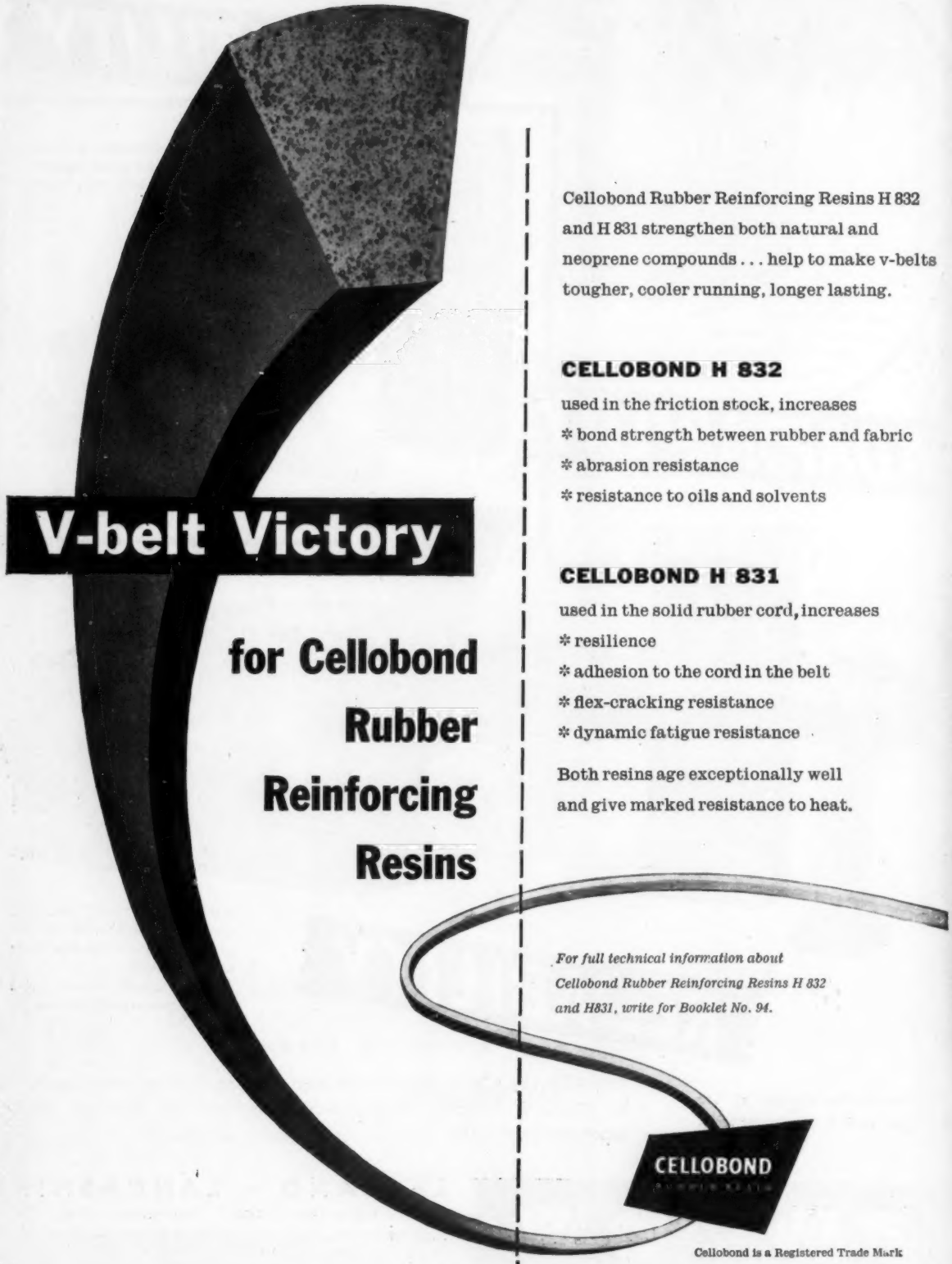

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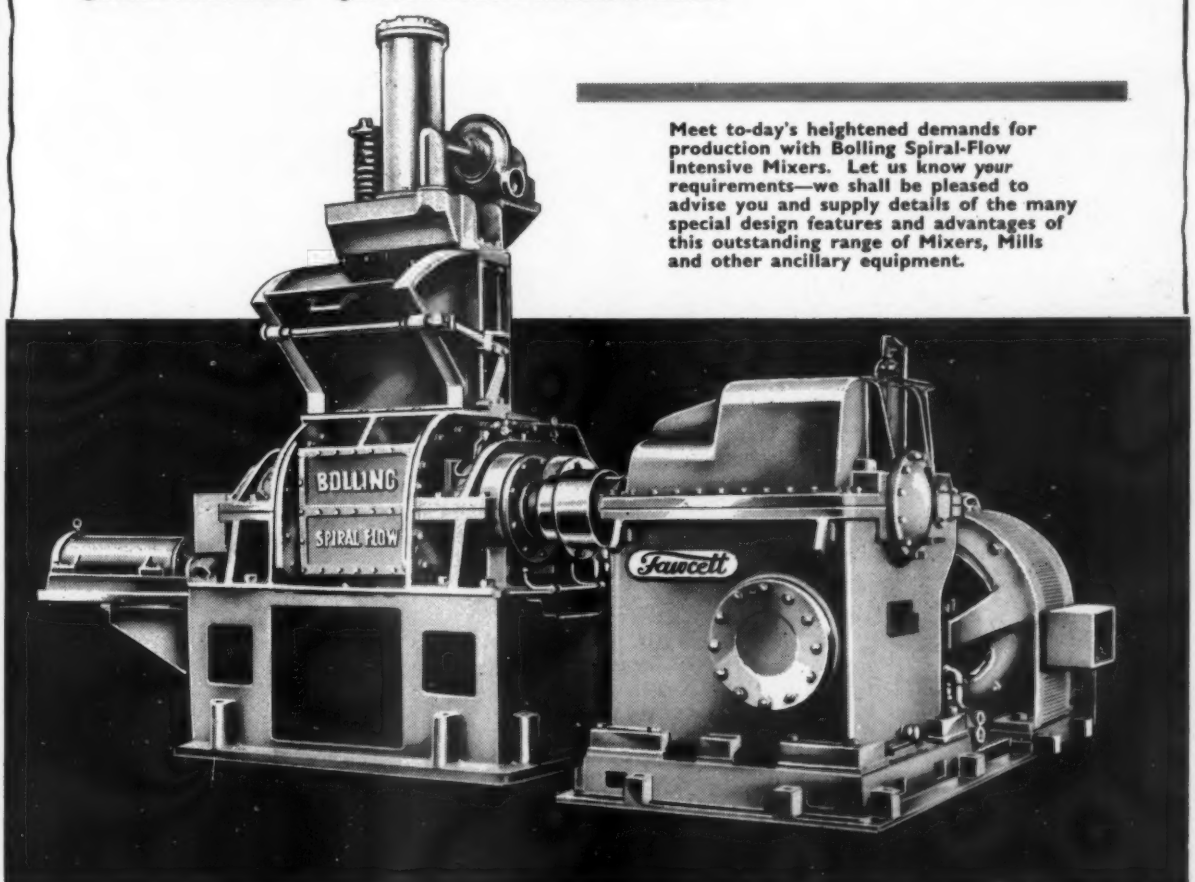

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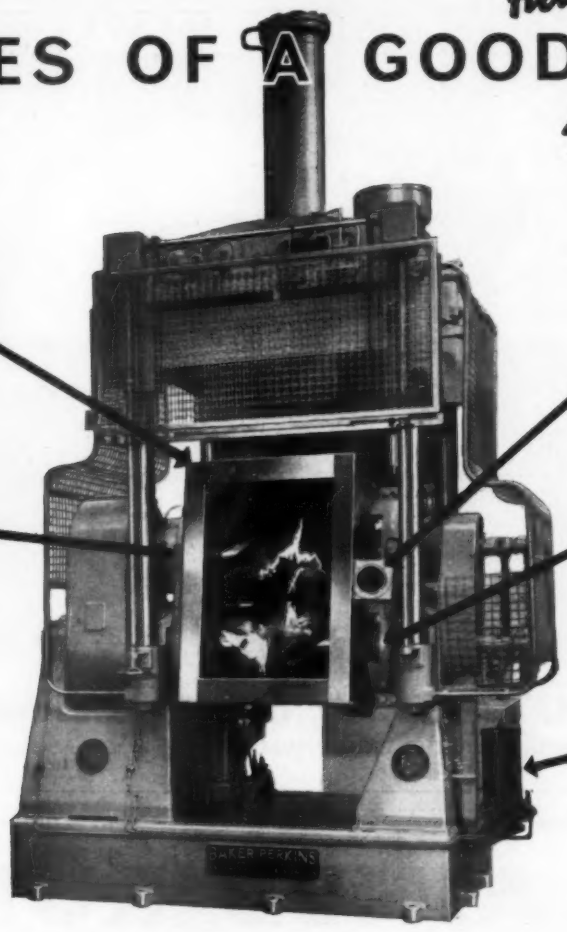
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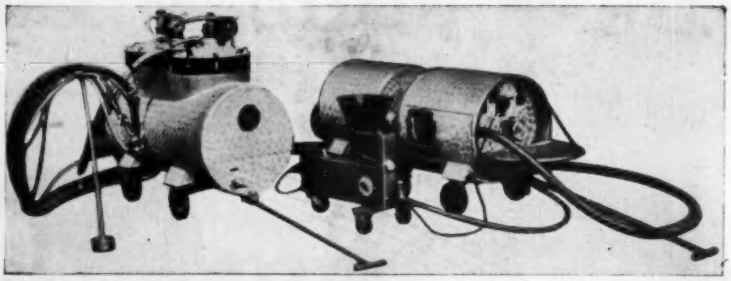

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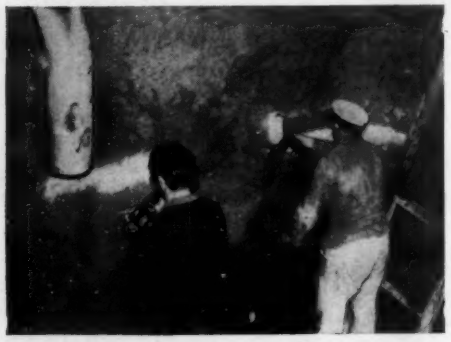

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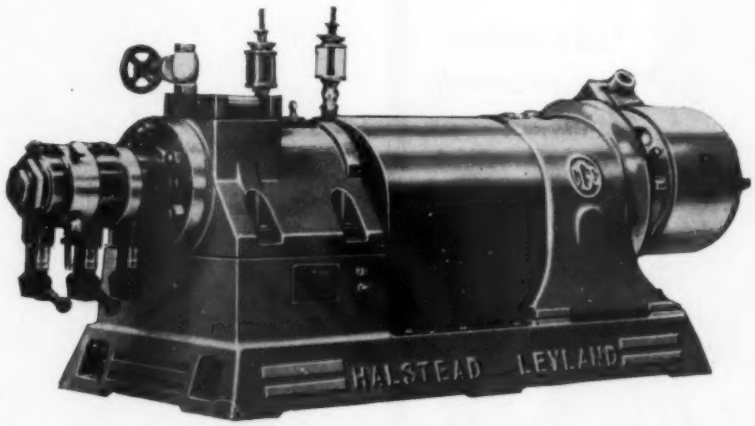

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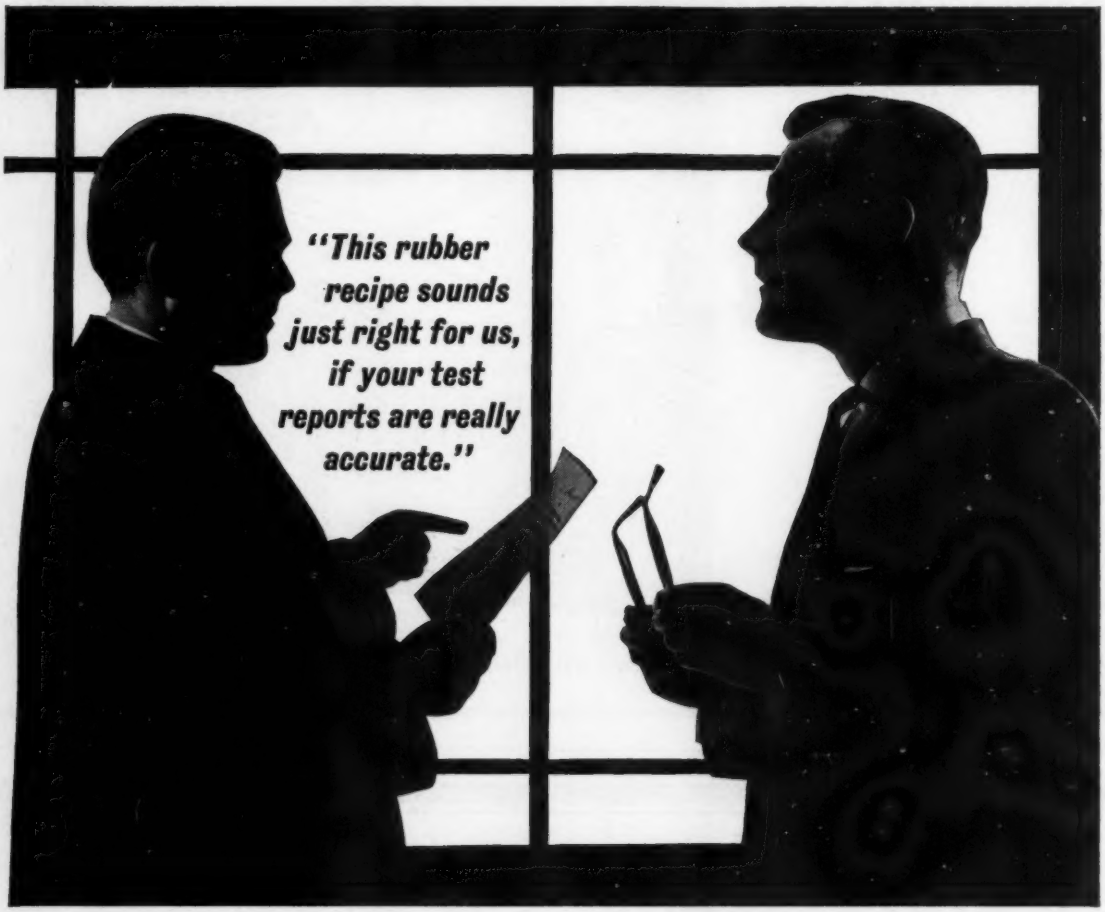

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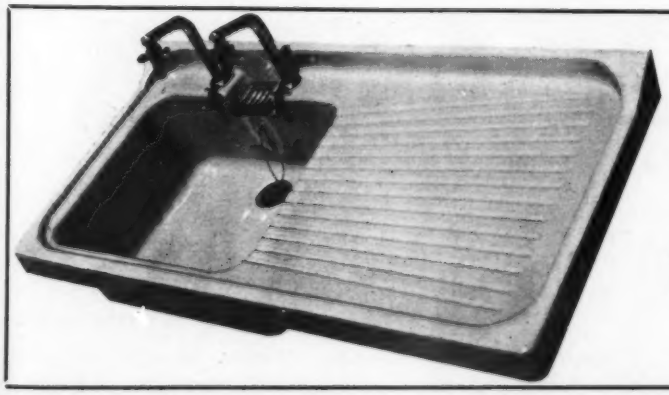

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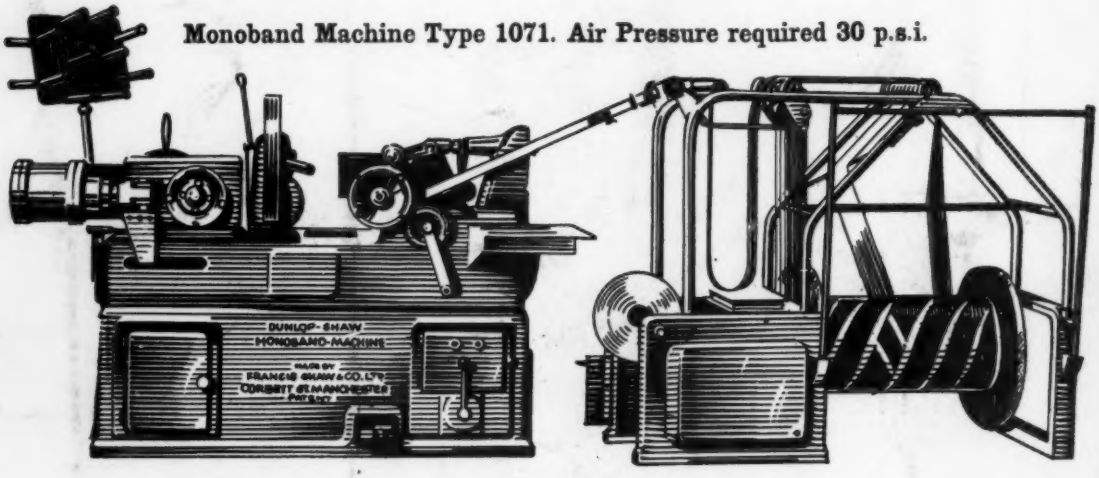

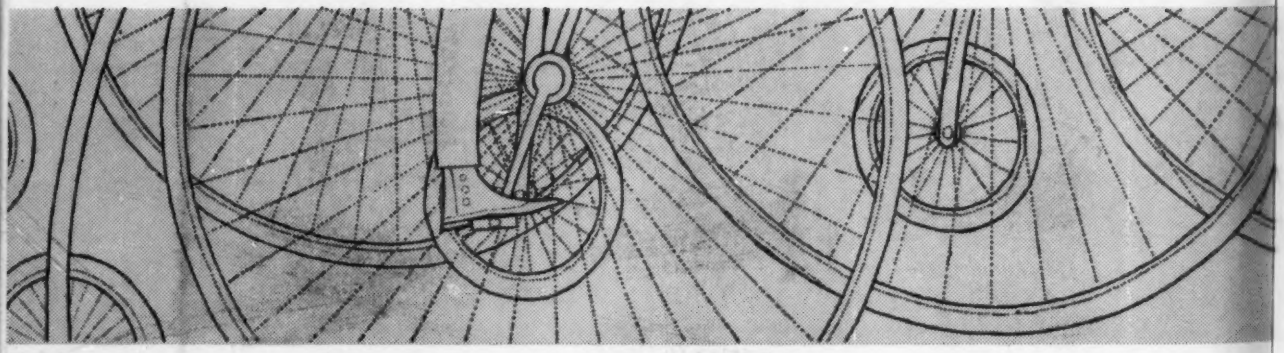

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